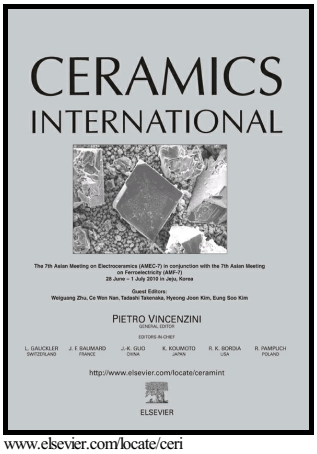

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Abstract

In this study, lead-free $Ba_{1-x}Ca_xZr_yTi_{1-y}O_3$ (BCTZ(x, y)) ceramics were prepared by means of the classic solid-state reaction method. The morphotropic phase transition (MPB) from the orthorhombic to the tetragonal phase (O-T) was identified in this composition. Besides, the identification of those two structures at room temperature (RT) was made possible thanks to an X-ray diffraction (XRD) study. In order to determine the phase transitions dielectric measurements were conducted. Based on Maxwell equation, the electrocaloric (EC) effect in the studied ceramics was performed via the indirect method. The compositions gave maximum EC temperature changes (ΔT) at above their T_C on application of a 3 kV/mm electric field. These temperature changes are ΔT=0.565K at T_{EC}=392K, ΔT=0.548K at T_{EC}=365K and ΔT=0.235K at T_{EC}=307K for BCZT(10%,5%), BCZT(13%,10%) and BCZT(20%,15%), respectively. At RT, these compositions provided a very interesting EC coefficient ($\xi = \Delta T/\Delta E$) compared to the pure $BaTiO_3$ (BT). These values, lying between 0.105 Kmm/kV and 0.188Kmm/kV for ΔE = 3 kV/mm, are also greater than those related to some lead-based ferroelectric.